

Algebra 1 3.5

Recognize arithmetic sequences

Relate arithmetic sequences to linear functions...tricky
sequence *rule*

term

arithmetic sequence

common difference (d)

whiteboards

20, 15, 10, 5 ...
+ -5

+ rule (5n + 20)
= amount added

8, 11, 14, 17 ...

d = 3

2, 4, 6, 8... 10 12 ...

KeyConcept Arithmetic Sequence

Words

An arithmetic sequence is a numerical pattern that increases or decreases at a constant rate called the *common difference*.

Examples

3, 5, 7, 9, 11, ...

+2 +2 +2 +2

$$d = 2$$

33, 29, 25, 21, 17, ...

-4 -4 -4 -4

$$d = -4$$

Example 1 Determine whether each sequence is an arithmetic sequence. Write *yes* or *no*.
Explain.

8. $-3, 1, 5, 9, \dots$

yes $d = 4$

What's the rule?

What's the rule? What comes next?

Example 2 Find the Next Term

Find the next three terms of the arithmetic sequence 15, 9, 3, -3,

$$d = -6$$

$$-3 + -6 = -9$$

$$-9 + -6 = -15$$

$$-15 + -6 = -21$$

What's the rule? What comes next?

Find the next three terms of each arithmetic sequence.

30, 36, 42

a_1 a_2 a_3 a_4
12. 0.02, 1.08, 2.14, 3.2, ...

13. 6, 12, 18, 24, ...

a_1 ✓ ✓ ✓ a_2

$$\begin{array}{r} 0.02 + d = 1.08 \\ -0.02 \end{array}$$

$$d = 1.06$$

4.26, 5.32, 6.38

$$\begin{array}{r} 6 + d = 12 \\ -6 \\ \hline d = 6 \end{array}$$

Guided Practice

2. Find the next four terms of the arithmetic sequence 9.5, 11.0, 12.5, 14.0,

$$\begin{array}{r} 9.5 + d = 11 \\ - 9.5 \quad - 9.5 \\ \hline d = 1.5 \end{array}$$

✓ ✓ ✓
15.5, 17, 18.5, 20

First term is 8, and common difference is 3...

$$a_1 = 8$$

$$a_2 = 8 + 3 = 11$$

$$a_3 = 8 + 3 + 3 = 14$$

$$a_4 = 8 + 3 + 3 + 3 = 17$$

$$a_5 = 8 + 3 + 3 + 3 + 3 = 20$$

$$a_6 = 5 \cdot 3 + 8 = 23$$

$$a_7 = 6 \cdot 3 + 8 = 26$$

⋮

$$a_{12} = 11 \cdot 3 + 8 = 41$$

⋮

Term	Symbol	In Terms of a_1 and d	Numbers
first term	a_1	a_1	$a_{37} = 36 \cdot 3 + 8 = 116$

$$a_n = (n-1)(d) + a_1$$

Key Concept n th Term of an Arithmetic Sequence

The n th term of an arithmetic sequence with first term a_1 and common difference d is given by $a_n = a_1 + (n - 1)d$, where n is a positive integer.

↑ ↑
1st term 1 less (diff)

Why is it one less????

$$\begin{aligned} a_{99} &= 8 + 98(3) \\ &= 8 + 294 \\ &= 302 \end{aligned}$$

Recursive equation...explicit equation

p. 193 8-21 all

Example 3 Find the n th Term

- a. Write an equation for the n th term of the arithmetic sequence

$-12, -8, -4, 0, \dots$

$d = 4$

$$\begin{array}{r} -12 + d = -8 \\ +12 \quad +12 \end{array}$$

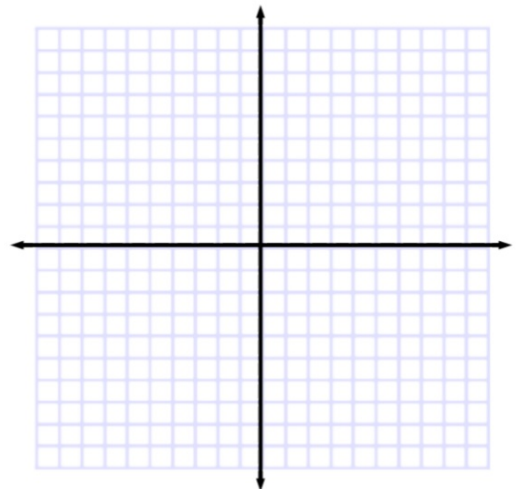
$$a_n = -12 + (n-1)(4)$$

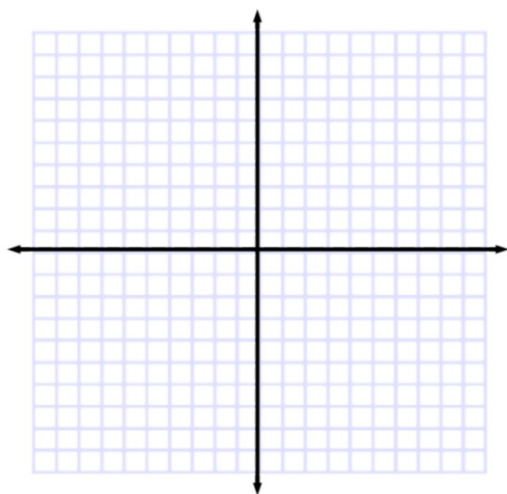
- b. Find the 9th term of the sequence.

$$\begin{aligned} a_9 &= -12 + (8)(4) \\ &= 20 \end{aligned}$$

- c. Graph the first five terms of the sequence.

Think of them like ordered pairs...
(because they are)

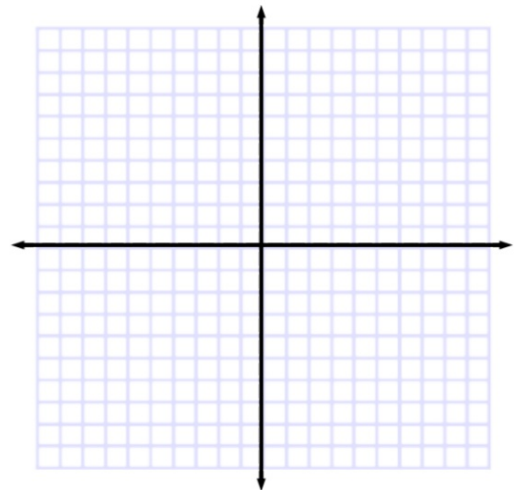




c. Graph the first five terms of the sequence.

n	$4n - 16$	a_n	(n, a_n)
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d. Which term of the sequence is 32?



Guided Practice

Consider the arithmetic sequence $3, -10, -23, -36, \dots$.

- 3A.** Write an equation for the n th term of the sequence.
- 3B.** Find the 15th term in the sequence.
- 3C.** Graph the first five terms of the sequence.
- 3D.** Which term of the sequence is -114 ?

GuidedPractice

4. **TRACK** The chart below shows the length of Martin's long jumps.

Jump	1	2	3	4
Length (ft)	8	9.5	11	12.5

- A. Write a function to represent this arithmetic sequence.
- B. Then graph the function.